

BOX PATENT APPLICATION
Attorney Docket No.: 24580
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Gerd HUGO

Serial No. Not yet assigned

Filed: April 25, 2001

For: **COATING WITH SPECTRAL SELECTIVITY**

(This is a Continuation of International Application PCT/EP99/08059, with an international filing date of 25 October 1999)

PRELIMINARY AMENDMENT

Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to examining on the merits and calculating the filing fee for the continuation application filed herewith, please enter the following amendments:

IN THE CLAIMS:

Please amend the following claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 and 16 as per attached with this preliminary amendment. Please cancel claim 17. Please add new claim 18.

REMARKS

The above amendments have been made to remove multiple dependencies from the claims and to conform them to U.S. practice. No new matter has been added. Pursuant to the new rules implementing the AIPA, a clean copy of the amended and added claims is attached along with a marked-up copy of the claims indicating the proposed claim amendments.

Respectfully submitted,

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GMN/dd:AMENDpreml.AIPA

CLEAN COPY OF CLAIMS AS AMENDED AND ADDED

1. (Amended) A coating with spectral selectivity comprising
 - a) a binder having a transmission of 60 % or more in the near-infrared wavelength range of 0.7 to 2.5 μm and a transmission of 40 % or more in the thermal infrared wavelength range;
 - b) first pigments which absorb 40 % or more of the visible light in the wavelength range of 0.35 to 0.7 μm , have a backscatter of 40 % or more in the near-infrared range of 0.7 to 2.5 μm and have an absorption of 60 % or less in the thermal infrared wavelength range;
 - c) second pigments having a backscatter or reflection of 40 % or more in the thermal infrared wavelength range.
2. (Amended) A coating with spectral selectivity according to claim 1, characterised in that
 - a) the binder has a transmission of 75 % or more in the near- infrared wavelength range of 0.7 to 2.5 μm and a transmission of 50 % or more in the thermal infrared wavelength range;
 - b) the first pigments absorb 60 % or more of the visible light in the wavelength range of 0.35 to 0.7 μm , have a backscatter or 50% or more in the near-infrared range of 0.7 to 2.5 μm and have an absorption of 50 % or less in the thermal infrared wavelength range; and
 - c) the second pigments have a backscatter or reflection of 50 % or more in the thermal infrared wavelength.
3. (Amended) A coating with spectral selectivity according to claim 1, characterised in that the binder is selected from at least one of the following groups:

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a) aqueous dispersions and emulsions on the basis of acrylates, styrene acrylate, polyethylene, polyethylene oxide, ethylene acrylic acid copolymer, methacrylate, vinyl pyrrolidone vinyl acetate copolymers, polyvinyl pyrrolidone, polyisopropyl acrylate, polyurethanes, terpene and rosin resins;

b) binders containing solvents, comprising acryl, cyclised and butyl rubber, hydrocarbon resins, terpene resins, nitro, acetyl and ethyl cellulose, α -methyl styrene acrylonitrile copolymers, polyester imide, acrylic acid butyl esters, poly(meth)acrylic acid esters, polyurethanes, aliphatic polyurethanes, chlorosulfonated polyethylene and

c) thermoplastic materials selected from the group consisting of polyolefins and polyvinyl compounds, polytetrafluoroethylene, and polyamide.

4. (Amended) A coating with spectral selectivity according to claim 1, characterised in that the first pigments are selected from at least one of the following groups:

a) inorganic pigments, selected from the group consisting of lead, zinc, iron, chromium, cadmium, barium, titanium, cobalt, aluminum and silicon compounds;

b) organic pigments, comprising natural dyes of animal and plant origin and synthetic organic dyes and pigments.

5. (Amended) A coating having spectral selectivity according to claim 1, characterised in that the first pigments are transparent or translucent pigments.

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6. (Amended) A coating having spectral selectivity according to claim 1, characterised in that the second pigments are platelet-shaped and are selected from at least one of the following groups:
 - a) metal or metal alloys, selected from aluminum, aluminum bronze, antimony, chromium, iron, gold, iridium, copper, magnesium, molybdenum, nickel, palladium, platinum, silver, tantalum, bismuth, tungsten, zinc, tin, bronze, brass, nickel silver, a nickel/chromium alloy, niccolite, constantan, manganin and steel;
 - b) electrically non-conducting materials coated or covered with metal or metal alloys, said metals being selected from aluminum, aluminum bronze, antimony, chromium, iron, gold, iridium, copper, magnesium, molybdenum, nickel, palladium, platinum, silver, tantalum, bismuth, tungsten, zinc, tin, bronze, brass, nickel silver, a nickel/chromium alloy, niccolite, constantan, manganin, steel or electrically conducting stannous oxide;
 - c) laminated pigments composed of at least three layers, the middle layer having a smaller refractive index than the outer layers and the materials thereof being selected from the group of materials having a transmission of $\geq 20\%$ in the wavelength range of 5 to 25 μm .
7. (Amended) A coating with spectral selectivity according to claim 1, characterised in that the second pigments are surface- treated, platelet- shaped metal pigments, the surfaces of which have been treated in such a manner that they absorb more than 40 % of the visible light in the wavelength range of 0.35 to 0.7 μm , have a reflection of more than 50 % in the near-infrared range of 0.7 to 2.5 μm and have a reflection of more than 40 % in the thermal infrared wavelength range.
8. (Amended) A coating having spectral selectivity according to claim 1, characterised in that the second pigments are approximately spherical and are substantially single crystals, the mean diameter d of the single crystals being determined by the formula

$$d = 14 \mu\text{m} / 2.1 \cdot (n_{T14} - n_{B14}),$$

wherein n_{T14} is the refractive index of the spherical particle at a wavelength of 14 μm and n_{B14} is the refractive index of the binder at a wavelength of 14 μm .

D E M A D E

9. (Amended) A coating with spectral selectivity according to claim 1, characterised in that the second pigments are selected from the group consisting of metal sulfides, metal selenides, metal fluorides, metal carbonates, metal antimonites, metal oxides, barium titanate, barium ferrite, calcium sulfate, barium sulfate and of mixed crystals of said substances.
10. (Amended) A coating with spectral selectivity according to claim 1, characterised in that the second pigments are hollow spheres having a diameter of 10 to 100 μm , preferably 10 to 30 μm , the wall of which consists of at least one material selected from acrylate, styrene acrylate, acrylonitril copolymer, polyethylene, polyethylene oxidate, chlorosulfonated polyethylene, ethylene acrylic acid copolymer, methacrylate, vinyl pyrrolidone vinyl acetate copolymer, vinylidene chloride copolymer, polyvinyl pyrrolidone, polyisopropyl acrylate, polyurethane, from cyclised rubber, butyl rubber, hydrocarbon resin, α -methyl styrene acrylonitrile copolymer, polyester imide, acrylic acid butyl ester, polyacrylic acid ester.
11. (Amended) A coating with spectral selectivity according to claim 1, characterised in that the second pigments are a mixture of single crystals and hollow spheres.
12. (Amended) A coating with spectral selectivity according to claim 1, characterised in that the second platelet-shaped pigments in the binder are aligned in such a manner that they form an angle of 30° to 60° to the normal line of the surface.
13. (Amended) A coating with spectral selectivity according to claim 1, characterised in that additional pigments are used to achieve a matting effect, said additional pigments having a transmission of 40 % or more in the thermal infrared wavelength range and being approximately spherical and substantially being single crystals, the mean diameter d of the single crystal being determined by the formula
$$d = \lambda / 2.1 \cdot (n_T - n_B),$$
wherein n_T is the refractive index of the spherical particle at the wavelength λ , n_B is the refractive index of the binder at a wavelength of λ and λ is a wavelength in the range of visible light.
14. (Amended) A coating with spectral selectivity according to claim 1, characterised in that the additional pigments are selected from the group consisting of metal sulfides, metal selenides, fluorides, carbonates, antimonides, metal oxides, barium titanate, barium ferrite, calcium sulfate, barium sulfate and from mixed crystals of representatives of the groups enumerated.

15. (Amended) A coating with spectral selectivity according to claim 1, characterised in that opaque polymer pigments organic pigments are used as additional pigments for matting purposes, said pigments having a transmission of 30 % or more in the thermal infrared wavelength range, having or forming a cavity in the dry state and the size of the polymeric or organic pigments being selected in such a manner that their mean diameter is 0.2 to 2.0 μm .
16. (Amended) A coating with spectral selectivity according to claim 1, characterised in that transparent red, green and blue pigments are used in addition to the first pigments.
18. A method of coating surfaces in motor vehicles comprising the step of applying a coating with spectral selectivity according to claim 1.

MARKED-UP COPY OF CLAIM AMENDMENTS

1. (Amended) A coating with spectral selectivity comprising

- a) a binder having a transmission of 60 % or more in the near-infrared wavelength range of 0.7 to 2.5 μm and a transmission of 40 % or more in the thermal infrared wavelength range;
- b) first pigments which absorb 40 % or more of the visible light in the wavelength range of 0.35 to 0.7 μm , have a backscatter of 40 % or more in the near-infrared range of 0.7 to 2.5 μm and have an absorption of 60 % or less in the thermal infrared wavelength range;
- c) second pigments having a backscatter [and/or] or reflection of 40 % or more in the thermal infrared wavelength range.

2. (Amended) A coating with spectral selectivity according to claim 1, characterised in that

- a) the binder has a transmission of 75 % or more in the near- infrared wavelength range of 0.7 to 2.5 μm and a transmission of 50 % or more in the thermal infrared wavelength range;
- b) the first pigments absorb 60 % or more of the visible light in the wavelength range of 0.35 to 0.7 μm , have a backscatter or 50% or more in the near-infrared range of 0.7 to 2.5 μm and have an absorption of 50 % or less in the thermal infrared wavelength range; and
- c) the second pigments have a backscatter [and/or] or reflection of 50 % or more in the thermal infrared wavelength.

3. (Amended) A coating with spectral selectivity according to claim 1 [or 2], characterised in that the binder is selected from at least one of the following groups:

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- a) aqueous dispersions and emulsions on the basis of acrylates, styrene acrylate, polyethylene, polyethylene oxide, ethylene acrylic acid copolymer, methacrylate, vinyl pyrrolidone vinyl acetate copolymers, polyvinyl pyrrolidone, polyisopropyl acrylate, polyurethanes, terpene and rosin resins;
- b) binders containing solvents, comprising acryl, cyclised and butyl rubber, hydrocarbon resins, terpene resins, nitro, acetyl and ethyl cellulose, α -methyl styrene acrylonitrile copolymers, polyester imide, acrylic acid butyl esters, poly(meth)acrylic acid esters, polyurethanes, aliphatic polyurethanes, chlorosulfonated polyethylene and
- c) thermoplastic materials [such as] selected from the group consisting of polyolefins and polyvinyl compounds, [especially polyethylene, polypropylene, Teflon®], polytetrafluoroethylene, and polyamide.

4. (Amended) A coating with spectral selectivity according to [at least one of the previous claims] claim 1, characterised in that the first pigments are selected from at least one of the following groups:

- a) inorganic pigments, selected from the group consisting of lead [compounds], zinc, iron, chromium, cadmium, barium, titanium, cobalt, [aluminium] aluminum and silicon compounds, [especially red iron oxides, chrome oxide green, chrome oxide hydrate, ultra marine blue and iron cyanide blue];
- b) organic pigments, comprising natural dyes of animal and plant origin [as well as] and synthetic organic dyes and pigments[, especially monoazo pigments, diazo pigments, indigo pigments, perylenes, quinacridones, dioxazines, metal-free phthalocyanines, especially and phthalocyanine pigment blue].

5. (Amended) A coating having spectral selectivity according to [at least one of the previous claims] claim 1, characterised in that the first pigments are transparent or translucent pigments[, especially transparent iron oxides and transparent organic pigments].

6. (Amended) A coating having spectral selectivity according to [at least one of the previous claims] claim 1, characterised in that the second pigments are platelet-shaped and are selected from at least one of the following groups:

- a) metal [and/or] or metal alloys, selected from [aluminium] aluminum, [aluminium] aluminum bronze, antimony, chromium, iron, gold, iridium, copper, magnesium, molybdenum, nickel, palladium, platinum, silver, tantalum, bismuth, tungsten, zinc, tin, bronze, brass, nickel silver, a nickel/chromium alloy, niccolite, constantan, manganin and steel;
- b) electrically non-conducting materials coated [and/or] or covered with metal or metal alloys, said metals being selected from [aluminium] aluminum, [aluminium] aluminum bronze, antimony, chromium, iron, gold, iridium, copper, magnesium, molybdenum, nickel, palladium, platinum, silver, tantalum, bismuth, tungsten, zinc, tin, bronze, brass, nickel silver, a nickel/chromium alloy, niccolite, constantan, manganin, steel or electrically conducting stannous oxide;
- c) laminated pigments composed of at least three layers, the middle layer having a smaller refractive index than the outer layers and the materials thereof being selected from the group of materials having a transmission of $\geq 20\%$ [, preferably $\geq 40\%$] in the wavelength range of 5 to $25\mu\text{m}$.

7. (Amended) A coating with spectral selectivity according to [at least one of the claims 1, 2 and 6] claim 1, characterised in that the second pigments are surface- treated, platelet-shaped metal pigments, the surfaces of which have been treated in such a manner that they absorb more than 40 %[, preferably more than 60 %] of the visible light in the wavelength range of 0.35 to $0.7\mu\text{m}$, have a reflection of more than 50 %[, preferably more than 60 %] in the near-infrared range of 0.7 to $2.5\mu\text{m}$ and have a reflection of more than 40 %[, preferably more than 50%] in the thermal infrared wavelength range.

8. (Amended) A coating having spectral selectivity according to [at least one of the claims 1 to 5] claim 1, characterised in that the second pigments are approximately spherical and are substantially single crystals, the mean diameter d of the single crystals being determined by the formula

$$d = 14 \mu\text{m} / 2.1 \cdot (n_{T14} - n_{B14}),$$

wherein n_{T14} is the refractive index of the spherical particle at a wavelength of $14\mu\text{m}$ and n_{B14} is the refractive index of the binder at a wavelength of $14\mu\text{m}$.

9. (Amended) A coating with spectral selectivity according to claim 1 [or 2], characterised in that the second pigments are selected from the group consisting of metal sulfides, metal selenides, metal fluorides, metal carbonates, metal antimonites, metal oxides, barium titanate, barium ferrite, calcium sulfate, barium sulfate and of mixed crystals of said substances[especially mixed crystals of barium sulfate with zinc sulfide].

10. (Amended) A coating with spectral selectivity according to claim 1 [or 2], characterised in that the second pigments are hollow spheres having a diameter of 10 to $100 \mu\text{m}$, preferably 10 to $30 \mu\text{m}$, the wall of which consists of at least one material selected from acrylate, styrene acrylate, acrylonitril copolymer, polyethylene, polyethylene oxidate, chlorosulfonated polyethylene, ethylene acrylic acid copolymer, methacrylate, vinyl pyrrolidone vinyl acetate copolymer, vinylidene chloride copolymer, polyvinyl pyrrolidone, polyisopropyl acrylate, polyurethane, from cyclised rubber, butyl rubber, hydrocarbon resin, α -methyl styrene acrylonitrile copolymer, polyester imide, acrylic acid butyl ester, polyacrylic acid ester.

11. (Amended) A coating with spectral selectivity according to [at least one of the claims 1, 2, 8, 9 and 10] claim 1, characterised in that the second pigments are a mixture of single crystals and hollow spheres.

12. (Amended) A coating with spectral selectivity according to [at least one of the claims 1, 2, 6 and 7] claim 1, characterised in that the second platelet-shaped pigments in the binder are aligned in such a manner that they form an angle of 30° to 60° to the normal line of the surface.

13. (Amended) A coating with spectral selectivity according to claim 1 [or 2], characterised in that additional pigments are used to achieve a matting effect, said additional pigments having a transmission of 40 % or more[*, preferably 50 % or more*] in the thermal infrared wavelength range and being approximately spherical and substantially being single crystals, the mean diameter d of the single crystal being determined by the formula

$$d = \lambda / 2.1 \cdot (n_T - n_B),$$

wherein n_T is the refractive index of the spherical particle at the wavelength λ , n_B is the refractive index of the binder at a wavelength of λ and λ is a wavelength in the range of visible light.

14. (Amended) A coating with spectral selectivity according to [at least one of the claims 1, 2 and 13] claim 1, characterised in that the additional pigments are selected from the group consisting of metal sulfides, metal selenides, fluorides, carbonates, antimonides, metal oxides, barium titanate, barium ferrite, calcium sulfate, barium sulfate and from mixed crystals of representatives of the groups enumerated[*, especially mixed crystals of barium sulfate with zinc sulfide*].

15. (Amended) A coating with spectral selectivity according to claim 1 [or 2], characterised in that opaque polymer pigments [*and/or*] or organic pigments are used as additional pigments for matting purposes, said pigments having a transmission of 30 % or more[*, preferably 40 % or more*] in the thermal infrared wavelength range, having [*and/or*] or forming a cavity in the dry state and the size of the polymeric or organic pigments being selected in such a manner that their mean diameter is 0.2 to 2.0 μm [*, preferably 0.4 to 0.8 μm*].

16. (Amended) A coating with spectral selectivity according to claim 1 [or 2], characterised in that transparent red, green and blue pigments are used in addition to the first pigments.

--18. A method of coating surfaces in motor vehicles comprising the step of applying a coating with spectral selectivity according to claim 1.--